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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
BROWN JR, NATHAN H	

ART UNIT	PAPER NUMBER
2121	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/758,322	MOGK ET AL.	
	Examiner	Art Unit	
	Nathan H. Brown, Jr.	2121	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *(3)* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 September 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3,5 and 7-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3,5 and 7-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *1/15/04* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Examiner's Detailed Office Action

1. This Office Action is responsive to the communication for application 10/758,322, filed September 15, 2006.

2. Claims 1, 3, 5, 7-12 are pending. It is noted that claims: 1, 3, 7, 8 have been amended (3, 7, and 8 from August 23, 2006); claims 2, 4, and 6 are cancelled; and claims 11 and 12 are new (from August 23, 2006).

3. After the first office action, claims 1-7 and 10 stand rejected while 8 and 9 are objected to:

Claims 1-6 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claims 1-6 are considered to comprise an abstract representation and an algorithm, which do not meet the standard set forth in the State Street Bank case of being tangible, useful, and concrete. In this instance the claims are not considered to be tangible since no real world result is provided. A method for checking whether an input data record is in a working range of a neural network, in the abstract, is not a real world result that has practical application.

Claims 1 and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by *Courrieu*, "Three Algorithms for Estimating the Domain of Validity of Feedfoward Neural Networks", 1994.

Regarding claim 1. *Courrieu* teaches a method for checking whether an input data record is in a working range of a neural network, comprising the following steps: (a) storing training input data records for the neural network (*see* p. 170, col. 1, para. 2, "From an operational standpoint, we can imagine some very simple solutions, such as calculating the distance between a point of generalization and the nearest known example...Unfortunately, the above solutions require that the entire learning set be available..."), forming a convex envelope being formed by means of the training input data records (*see* p. 170, col. 1, para. 2, "To obtain a more global estimate...use the hyperrectangle...", *Examiner interprets the hyperrectangle to be a convex envelope.*), (b) checking whether the input data record is in the convex envelope (*see* p. 170, col. 1, para. 2, "calculation of the distance from a point to the sphere", *Examiner interprets a distance from a point to the sphere greater than zero to mean the point is not in a hull polytope (i.e., convex envelope) circumscribed by the sphere.*).

Regarding claim 7. *Courrieu* teaches a system (see p. 172, §5.1 Computational Experiment, *Examiner interprets "a convergent generator" to be a system.*) for determining at least one predicted value (*see* p. 173, .para. 2, *Examiner interprets a "generalization test point" to be a predicted value.*), comprising at least one neural network (*see* p. 173, .para. 2, *Examiner interprets the set of neural networks produced by the generator to comprise at least one neural network.*) which has been trained using a set of training input data records (*see* p. 173, .para. 2, *Examiner interprets the "64 points taken at random from a uniform distribution in the cube* $[-1,1]^3$ *to be training input data records.*), means for checking whether one of the input data record for the neural network is in the convex envelope which is formed by the training input data records (*see* p. 173, .para. 2, *Examiner interprets the absolute errors for a generalization test to*

comprise the distances of the input data records from the convex envelope formed by the training input data, thus one absolute error ≤ 0 implies a check which determines that an input data point is in the convex hull.).

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Courrieu* in view of *Wennmyr*, "A Convex Hull Algorithm for Neural Networks", 1989.

Regarding claim 10. *Courrieu* teaches a method according to claim 1. *Courrieu* does not teach a computer digital storage medium program product for carrying out a method according to claim 1. *Wennmyr* does teach a computer digital storage medium program product for carrying out a method according to claim 1 (see pp. 1481-1482, §V. Stored Information and §VI. Implementation). It would have been obvious at the time the invention was made to persons having ordinary skill in the art to combine *Courrieu* with *Wennmyr* to efficiently obtain the means of deciding whether a given point is inside a convex region (i.e., envelope) by generating the convex region with a time complexity O(N) or O(const) (*see* p. 1478, col. 1, para. 3).

Claim Rejections - 35 USC § 101

4. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5. Claims 1, 3, 5, and 7-12 rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter: mathematical algorithm and/or software per se.

Claims 1, 3, 11, and 12 recite a "method for checking whether an input data record is in a working range of a neural network, wherein working range is defined by the convex envelope". Points (i)-(xi) of amended claims 1 and 3 recite mathematical operations on data records, points, and simplices. New claim 11 provides alternative steps for an algorithm to accomplish what claims 1 and 3 recite. New claim 12 provides further mathematical detail. Clearly, claims 1, 3, 11, and 12 recite no more than the §101 judicial exception of mathematical algorithm. Further, claims 1, 3, 11, and 12 involve no physical transformation and the final result, "delivering ... that input data record is inside or outside the convex envelope", is not a specific and substantial result tied to the physical world. Claims 1, 3, 11, and 12 are non-statutory under 35 U.S.C. 101.

Claim 10 recites "A computer digital storage medium program product for carrying out a method according to Claim 1." This is clearly a claim for a computer related invention which recites no data structure or structural and functional interrelationships between a data structure and computer software and hardware components which permit the data structure's functionality

to be realized, as claim 1 simply recites a set of mathematical operations on abstract objects. Claim 10 is non-statutory under 35 U.S.C. 101.

Claim 5 recites searching "a minimum of F ... in order to check whether a hyper-plane exists." This clearly recites no more than a §101 judicial exception of mathematical abstraction. Claim 5 and 3 are non-statutory under 35 U.S.C. 101.

Claims 7-9 recite a "system for determining at least one predicted value, comprising at least one neural network which has been trained using a set of training input data". Such a system is a computer related manufacture. Claims 7-9 recite no data structure combined with a medium and claim no more than the §101 judicial exception of software per se. The means language of claim 8 provides only a series of general steps for the checking computation and constitutes a §101 judicial exception of algorithm. Further, claims 7-9 would preempt the use of a "system for determining at least one predicted value, comprising at least one neural network which has been trained using a set of training input data", where a neural network and associated steps of computation for training and use for value prediction consist of mathematical operations on mathematical constructs. Claims 7-9 are clearly non-statutory under 35 U.S.C. 101.

Response to Arguments

6. Applicants' arguments filed August 10, 2006 have been fully considered but they are not persuasive.

Claim Rejection under 35 U.S.C. §101

Applicants argue that:

> Claims 1-6 are rejected as being directed to non- statutory subject matter. The rejection is respectfully traversed. Claim 1 is directed to a method for checking whether an input data record is in a working range of a neural network. The working range is defined by the convex envelope formed by the training input data records of the neural network, This method provides a steps for checking if certain input parameters are in an acceptable range from the training data, that is if the input parameters are within the working range of the neural network.

Examiner replies that the application of abstract geometric relationship of training data lying within a convex envelope with test data to determine "if certain input parameters are in an acceptable range from the training data" does disclose a practical, concrete, and tangible result, in that the relation can be used to establish a confidence interval on the estimation performance of a neural network for any training and test data. However, the claim seeks patent protection for the geometric relationship "in the abstract" as it seeks to pre-empt the use of that relationship in the area of machine learning (or a least neural network learning) through substituting the term "working range of the neural network" for convex hull, which is well recognized (see *Courrieu*, Abstract, "This article presents three simple algorithms for determining the distance between any point, and the domain of interpolation associated with a cluster of control points of a vectorial function. The first algorithm uses the convex hull polytope of the cluster in the support space to

accurately estimate the domain."). Therefore, the amended claim 1 preempts a §101 judicial exception and is non-statutory.

Examiner further points out that the method claims 3, 5, 11, and 12 merely supply the details of the mathematical and algorithmic operations that produce the result of claim 1. Thus claims: 3, 5, 11, and 12 disclose only the 35 U.S.C. §101 judicial exception of abstract idea, in the form of algorithm and mathematical manipulation and are therefore non-statutory under 35 U.S.C. §101.

Examiner also points out that while claims 7, 8, and 9 are system claims, they disclose no structural and functional language interrelated to a computer-readable medium which would allow descriptive material in the claims to be realized. Therefore claims 7, 8, and 9 are considered to be directed to software per se, and thus non-statutory under 35 U.S.C. §101.

Examiner maintains the rejection of claims 1, 3, and 5 under 35 U.S.C. §101 and adds 7-12 as a result of new grounds for rejection due to Applicant's amendments.

Claim Rejection under 35 U.S.C. §102

7. Applicants argue that:

> Claims 1-7 are rejected as being anticipated by Courrieu. For anticipation, a reference must teach each and every limitation of the claimed invention. Applicants submit that Courrieu teaches a method for checking whether an input data record is in a working range of neural network comprising three relative simple algorithmic solutions ... Thus, Courrieu's methods only provide likeliness results on whether the input data is within or outside the real convex hull. This is because both second and third algorithms only approximate the convex hull and do not lead to an exact definition of the convex hull. In contrast, Applicants invention concerns checking

> whether the input parameters are in an acceptable range from the training data, in other words, whether the input parameters are within the working range of the neural network.
>
> Accordingly, Applicants claims as submitted herewith are not anticipated by the Courrieu reference.

Examiner replies that if the input data are *likely* to be within the real convex hull of the "learning points" (training data), as can be established by the three algorithms disclosed by *Courrieu* , then the input parameters are *likely* to be within an acceptable range from the training data, and thus the input parameters are *likely* to be within the working range of the neural network. Consider the definition of "working range or a neural network" as defined on pp. 5-6 of the Specification:

> According to the invention, the working range of a neural network is defined by the convex envelope formed by the training input data records of the neural network.

(a mathematical definition of the convex hull is provided)

> According to one preferred embodiment of the invention, the direct surroundings of the convex envelope are also considered as a permitted working range as neural networks can also supply appropriate results in the direct vicinity of the convex envelope. However, the working range is alternatively restricted directly to the convex envelope as it is not possible to draw a precise conclusion as to where the "direct vicinity" ends. In particular for critical applications which relate, for example, to continuous production, the working range is therefore restricted to the interior of the convex envelope, the external surroundings in the direct vicinity of the convex envelope being excluded from the working range.

While pp. 6-8 provide a series of algebraic operations "to check whether an input data record is in the convex envelop" we can understand, from the above quote, that since 'it is not possible to draw a precise conclusion as to where the "direct vicinity" *(for appropriate results)* ends' [italics Examiner's], that Applicant's invention similarly provides "likeliness results", with respect to the working range, by restricting "the working range ... directly to the convex envelope".

Claims 1-7 remain rejected as being anticipated by *Courrieu*.

Claim Rejection under 35 U.S.C. §103

8. Applicants argue that:

> The Examiner rejected claim 10 as obvious over Courrieu in view of Wennmyr. Claim 10 is incorporating independent claim 1, which has been amended to further define the invention, as discussed above in the context of the discussion of the Courrieu reference. Applicants pointed out that Courrieu only provides both second and third algorithms which only approximate the convex hull and which do not lead to an exact definition of the convex hull and thus, only give likeliness result regarding whether the input data is within or outside the real convex hull. Wennmyr does not cure this deficiency.

Examiner responds that if the working range of the neural network is defined as the direct vicinity of the convex envelope (since the neural network can "supply appropriate results in the direct vicinity of the convex envelope") and "the working range is ... restricted directly to the convex envelope", Applicants have provided an approximate of the actual working range of the neural network; thus the argument shows no inventive difference (in this respect) between Applicants' invention and Courrieu in view of Wennmyr. Claim 10 remains rejected as being as obvious over Courrieu in view of Wennmyr.

Conclusion

Applicant's amendment necessitated the new ground(s) of 35 U.S.C. 101 rejection presented in this Office action. Accordingly, THIS ACTION IS MADE FINAL. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the

mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nathan H. Brown, Jr. whose telephone number is 571-272- 8632. The examiner can normally be reached on M-F 0830-1700. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anthony Knight can be reached on 571-272-3687. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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Nathan H. Brown, Jr.
December 1, 2006